HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Tulalip Fall Chinook
Species or Hatchery Stock:	Green River Fall Chinook
Agency/Operator:	Tulalip Tribes
Watershed and Region:	WRIA 7 (Snohomish), Puget Sound
Date Submitted:	March 2, 2004
Date Last Updated:	March 2, 2004

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program. Bernie Kai-Kai Gobin Hatchery, Tulalip fall Chinook.

1.2) Species and population (or stock) under propagation, and ESA status.

Chinook salmon (*Oncorhynchus tshawyhtscha),* Green River fall Chinook

1.3) Responsible organization and individuals

Indicate lead contact and on-site operations staff lead.

Name (and title): Steven Young, Hatchery Manager
Agency or Tribe: The Tulalip Tribes
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

Egg takes are conducted in cooperation with the Washington Department of Fish and Wildlife (WDFW) primarily at the Wallace River Hatchery and as a contingency, at other WDFW hatchery facilities using broodstock surplus to production needs.

1.4) Funding source, staffing level, and annual hatchery program operational costs.

Bureau of Indian Affairs, The Tulalip Tribes.

Staffing level: Four full-time Tulalip Tribal employees, and numerous seasonal workers: one eight months, one four months and from one to twelve temporary workers during spawning, egg shocking and picking, fish transfers, and tagging operations.

Operational costs, about $300,000 annually.

1.5) Location(s) of hatchery and associated facilities.

Tulalip Creek- WRIA 07.0001, RMPC Code- 3F10308 070001 R.
Tulalip Salmon Hatchery- WRIA 07.0001, RMPC Code- 3F10308 070001 H.

Tulalip Tribes Bernie Kai-Kai Gobin Salmon Hatchery:
10610 Waterworks Road
Tulalip, WA 98271

Located at the juncture of the east and west Forks of Tulalip Creek and just above the point at which Tulalip Creek feeds into Tony's Marsh, steam kilometer 2.0.

Upper Tulalip Creek pond:

near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

Located behind a dam just upstream from Lower Tulalip Creek Pond, which drain directly in to Tulalip Bay via a fish ladder, and/or a valved pond drain line. Anadromous fish passage is prevented above the Lower Tulalip Creek Pond. The Upper Tulalip Creek release pond is located in WRIA 7, stream number 0001, stream kilometer 0.1.

Lower Tulalip Creek pond and spawning station:

Near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

The Lower Tulalip Creek release pond is located just downstream from upper Tulalip Creek pond, which feeds it via a screened
outlet structure and a fish release formation from upper to lower Tulalip Creek ponds. WRIA 7, stream 0001, kilometer 0.0.

Battle (Mission) Creek rearing pond and spawning station:

Near to:
7615 Totem Beach Rd.
Tulalip, WA. 98271

The lower Tulalip Creek pond is located approximately 200 meters upstream from Tulalip Bay in WRIA 7, Stream number 0005, stream kilometer 0.2.

1.6) Type of program.

Isolated Harvest.

1.7) Purpose (Goal) of program.

The purpose of this program is to provide Chinook salmon for harvest by Tulalip Tribal members in a terminal area fishery. Production from this program is also available for harvest by the non-Indian sport fishery and contributes to other directed and incidental harvest of Chinook salmon in fisheries in southeast Alaska, British Columbia, and Puget Sound preterminal areas.

This HGMP reflects a major change in the primary source of Chinook broodstock for the Tulalip enhancement program from fall to summer Chinook returning to the Wallace River Hatchery, located on the Skykomish River. The hatchery fall Chinook stock is originally not native to the Skykomish River (they are of Green River origin). Summer Chinook are native Skykomish River stock. Effective with the 2003 return, the primary source of Chinook broodstock for the Tulalip enhancement program will change from non-local fall Chinook to native Skykomish River Chinook. This change will reverse the current program, and accompanying changes to the State-Tribal MOU agreement and Future Brood Document have also been made to reflect this change in source of broodstock.

We will continue to coded-wire tag approximately 100,000 Skykomish River Chinook and approximately 100,000 late-timed Chinook per year, with annual targeted total release numbers of 1,500,000 Skykomish River and 200,000 late-run Chinook fingerlings, respectively. Results from this study will provide analyses of comparative survival, contribution to directed and incidental fisheries, straying, and comparative incidental impacts on other listed Chinook stocks while harvesting each of these two stock components.

1.8) Justification.

Until listed wild stocks are recovered, hatchery production provides a harvestable surplus of salmon for Tulalip Tribal fisheries.

Since the Snohomish basin is managed for natural production, this shift toward indigenous summer stock will allow the state and Tribal programs to continue in a manner that is more compatible with wild stock goals. Shifting the primary source of Chinook hatchery production from this fall Chinook stock, originally of Green River origin, to the locally-adapted, summer Chinook stock, will provide an alternative to the Wallace River fall Chinook stock, or other out-of-basin Chinook stocks, that have been used in the past as the primary source of fall Chinook broodstock for this program. This stock is being phased out of the Washington State Department of Fish and Wildlife Wallace River Hatchery program, and broodstock returning to the hatchery have not been taken for production releases since 1996.

Since this change in source of broodstock may have a significant effect on survival and health during and after hatchery culture, the intent of this program is to provide a small-scale study to allow the Tribe to evaluate what this change will mean economically to its Treaty hatchery and harvest programs as well as to its resource management responsibilities. Specifically, it will afford comparisons of survival pre- and post-release, relative contribution to directed and incidental fisheries, comparative straying, and comparative incidental impacts on other listed Chinook stocks for each of these two stock components. Without this relative comparison, it will not be possible to evaluate how this change affects any of these factors, which are all extremely important to the Tulalip Tribes. This study will be limited to an annual release goal of 200,000 late-timed Chinook smolts. This comparative survival study is in accordance with recommendations of the Hatchery Scientific Review Group and was mandated in the Terms and Conditions developed by Tulalip and the National Marine Fisheries Service.

The Tulalip fall Chinook stock is classified as a secondary management unit in all areas, except 8D where the fishery is managed to target Tulalip Chinook while minimizing interceptions of other Chinook stocks. All Chinook salmon production from Bernie Kai-Kai Gobin hatchery will be thermally (otolith) mass-marked by their stock of origin, and 100,000 of each stock will be adipose fin-clipped and coded-wire tagged annually so that hatchery returns originating from each stock can be identified in terminal fisheries and on natural spawning grounds. The Stillaguamish and Snohomish natural summer/fall Chinook are primary management units.

1.9) List of program "Performance Standards".

Note, annual accomplishment of research, monitoring, and evaluation projects listed throughout this HGMP and in performance standards and indicators is contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects have been accomplished primarily through acquiring Hatchery Reform and BIA self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Goal (Section 1.7-1.8)	**Performance Standard** (Section 1.9)	**Performance Indicator** (Section 1.10)
Compare pre- and post-release survival rates.	Survival rates of fall Chinook are comparable to those of summer Chinook, pre- and post-release.	On average the estimate of survival rate for the hatchery production remains above 0.005 for both stocks to provide: • for the recruitment of December Age 3 fish of, and • an average terminal harvest rate of > .95
Compare relative contribution to directed and incidental fisheries, comparative straying, and comparative incidental impacts on other listed	▪ Harvest directed at Tulalip fall Chinook does not unduly impact listed wild populations when considered in conjunction with all	▪ Annual fisheries plans project exploitation rates below the Co-managers' guidelines for all Puget Sound Chinook management units.

Goal (Section 1.7-1.8)	**Performance Standard** (Section 1.9)	**Performance Indicator** (Section 1.10)
Chinook stocks.	other harvest-related impacts on these populations. ▪ Straying of reduced numbers of fall stock is negligible. ▪ Study compares stray rates among summer and fall stocks.	▪ Post-season assessments of exploitation rates on Stillaguamish and Snohomish Chinook are below the Co-managers' guidelines. ▪ Fall Chinook stray rates decrease in the Snohomish basin over rates measured in Rawson et al. (2001), ▪ Study affords comparative analyses of stray rates among fall and summer stock components
Provide the broodstock needed for releases to evaluate the shift in broodstock and to supplement the Tulalip Tribal hatchery and Chinook fishery.	Sufficient fall Chinook eggs are available for the experimental release and to supplement summer Chinook production releases.	Fall Chinook broodstock collections provide 200,000 eyed eggs for the experimental release, and sufficient additional eggs to supplement summer Chinook egg shortfalls during broodstock transition to achieve the 1.6 million production eyed egg take goal.
Limit genetic and ecological impacts to natural population to acceptable levels	Reduced fall Chinook release levels do not contribute significantly to the naturally spawning population.	The proportion of Tulalip origin fall Chinook spawners in the natural spawning areas is below contribution rates measured in Rawson et al. (2001), and remains below Co-managers' guidelines.
	Broodstock collection shall be carried out without any risks to the natural population	See the Wallace River Hatchery HGMP
	Release practices do not impact natural production.	Evaluate the level of interaction of hatchery fall Chinook bay releases with out-migrating natural smolts. Test the hypothesis that the time of the peak abundance of Tulalip fall and naturally-produced juvenile Chinook in Tulalip Bay do not differ significantly.

1.10) List of program "Performance Indicators"

See table in question 1.9.

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

No fish are collected at Tulalip Hatchery or from natural populations. A total of 200,000 eyed, late-run Chinook eggs will be transferred annually from returns to the WDFW Wallace River Hatchery. A 2003 State-Tribal MOU agreement describes understandings and agreements concerning summer and fall Chinook culture programs of the Tulalip Bernie Kai-Kai Gobin Salmon Hatchery, operated by the Tulalip Tribes, and the Wallace River Hatchery, operated by WDFW. This MOU describes specific contingency plans to collect additional fall Chinook to supplement summer Chinook production on years when summer Chinook egg shortfalls might occur (See Section 6; Broodstock Origin and Identity, for further details).

No Chinook broodstock will be collected at the Tulalip Hatchery or from natural populations at the Wallace River Hatchery. For at least the next four years (2003 to 2007), the Tulalip Tribal Bernie Kai-Kai Gobin Hatchery will receive 200,000 eyed eggs per year from fall Chinook returns to the WDFW Wallace River Hatchery for experimental release purposes. Approximately 100,000 summer Chinook and approximately 100,000 fall Chinook per year will be coded-wire tagged and adipose fin-clipped, with annual targeted total release numbers of 200,000 and 1,500,000 fall and summer Chinook fingerlings, respectively. Results from this study will provide comparative survival estimates, relative stock contributions to directed and incidental fisheries, straying estimates, and comparative incidental fishery impacts on other listed Chinook stocks, as previously described

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Fingerling	Tulalip Bay	200,000

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

See http://www.nwifc.wa.gov/CRAS. Survival estimates are based on CWT recoveries. Otolith mass marking will also be used to estimate stratified escapement of natural and hatchery components to natural and hatchery spawning areas as described in Rawson et al. (2001).

1.13) Date program started (years in operation), or is expected to start.

Fall Chinook, originating from out of basin (primarily Green River stock), were the primary Chinook stock cultured at the Wallace River Hatchery for many years. As returns to the Skykomish River increased from these introductions, fall Chinook were collected at the Wallace River Hatchery rack, supplemented by additional fall Chinook collected from out of basin until the broodstock program was discontinued, effective with the 1997 return to the Skykomish River. A series of MOU Agreements between the Tulalip Tribe and the Washington State Department of Fisheries, beginning in 1981 (May 20, 1981; Attachment 2.), revised in 1997 (August 26, 1997) and updated in 2004 (February 10, 2004) outline the evolution of the cooperative Chinook enhancement program between WDFW and Tulalip Tribal hatcheries..

1.14) Expected duration of program.

The cooperative Chinook enhancement program described above is evolving away from the use of fall Chinook for production releases. Currently, this HGMP and the previously mentioned MOU agreements describe plans to continue to collect small numbers of fall stock for experimental purposes for at least the next four years (1993 to 1997), and to collect additional fall Chinook, if necessary, to supplement summer Chinook production egg take goals during the transition to summer stock, as the fall stock is phased out over the next few years.

1.15) Watersheds targeted by program.

Tulalip Bay (WRIA 7). The program is designed so that as close as possible to 100% of the return will be harvested in the Tulalip Bay Area 8D terminal area fishery, so that little or no hatchery returns will return to spawn naturally.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

N/A

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

2.1) List all ESA permits or authorizations in hand for the hatchery program.

This HGMP is being developed to provide the basis for an incidental take permit under a 4(d) rule.

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Threatened populations of Chinook salmon within the Puget Sound ESU, including north and south fork Stillaguamish, Snoqualmie, and Skykomish Chinook may be affected by this program

(Rawson et al. (2001), however, the reduced release levels described in this HGMP are expected to reduce or eliminate straying rates and subsequent introgression with the stocks listed above. The population classifications of the stocks listed above are tentative pending completion of final population delineation for the Puget Sound ESU. See the WDFW Wallace River HGMP for anticipated levels of take. Other take actions might include competition between listed summer and hatchery-origin fall Chinook in nearshore areas during release. Although the extent, if any, of these potential interactions is unknown at this time, the reduction in fall Chinook production described in this HGMP is expected to reduce any potential competition among program and listed fish.

- Identify the ESA-listed population(s) that will be directly affected by the program.

None

- **Identify the ESA-listed population(s) that may be incidentally affected by the program.**

See the WDFW Wallace River Hatchery HGMP for incidental effects of broodstock collection on listed populations.

Juvenile estuarine and nearshore residency of listed Puget Sound Chinook salmon may overlap with juveniles released by this program. Potential competitive effects are unknown at this time. Out-migration studies currently underway in the Snohomish and Stillaguamish systems will provide better information on the timing and interaction among program juvenile Chinook and listed juvenile out-migrants so that we can assess the extent to which potential overlap may occur.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- **Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds.**

Currently, listed Chinook salmon populations from the Stillaguamish basin (North Fork Stillaguamish and South Fork Stillaguamish) and Snohomish basin (Skykomish and Snoqualmie) are above critical thresholds. All four populations are at levels substantially below the Co-managers' recovery goals. Both the Stillaguamish and Snohomish watersheds have active recovery planning groups developing Chinook recovery plans, which will include actions in the areas of harvest, hatchery, and habitat management.

- **Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.**

Table 4. Reconstruction of total recruitment and recruits per spawner (Rawson 2000) Stillaguamish summer Chinook.

Brood Year	Escapement	Brood Year Escapement	Brood Year Exploitation Rate	Brood Year Recruitment	Recruits Per Spawner
1986	980	505	0.66	1505	1.54
1987	1065	695	0.46	1278	1.2
1988	516	654	0.64	1832	3.55
1989	510	458	0.82	2544	4.99
1990	585	488	0.67	1457	2.53
1991	1331	486	0.53	1040	0.78
1992	466	496	0.38	959	2.06
1993	563	585	0.5	1165	2.07

- **Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.**

Chinook escapments
STILLAGUAMISH SYSTEM

Year	Summer (N. Fork)	Fall (S. Fork)	Total
1991	1,331	301	1,632
1992	486	294	780
1993	583	345	928
1994	667	287	954
1995	599	223	822
1996	993	251	1,244
1997	930	226	1,156
1998	1,292	248	1,540
1999	845	253	1,098
2000	1,403	243	1,646
2001	1,066	283	1,349
2002	1,196	393	1,589

SOURCE: WDFW, 2002 estimates preliminary

Chinook escapments
SNOHOMISH SYSTEM

Year	Skykomish	Snoqualmie	Total
1991	2,192	628	2,820
1992	2,002	706	2,708
1993	1,653	2,366	4,019
1994	2,898	728	3,626
1995	2,791	385	3,176
1996	3,819	1,032	4,851
1997	2,355	1,937	4,292
1998	4,412	1,892	6,304
1999	3,455	1,344	4,799
2000	4,665	1,427	6,092
2001	4,575	3,589	8,164
2002	4,224	2,996	7,220

SOURCE: WDFW, 2002 estimates preliminary

- **Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.**

Mass-marking of Tulalip fall Chinook was initiated with the 1993 brood year. Estimates of the contribution of Tulalip fall Chinook to natural spawning populations in the Snohomish system have been computed from otolith recoveries from spawned out carcasses beginning with the 1997 return year (Rawson et al. 2001). Summarized results for the 1997 and 1998 returns are shown in the following two tables:

Estimates of hatchery contribution of Chinook salmon to natural spawning populations in the Snohomish system, 1997.

	Spawning Escapement by Origin			
Subbasin	Natural Origin	Tulalip Hatch.	Other Hatch.	Total
Wallace River	289	72	352	713
	41%	*10%*	*49%*	
Skykomish/Pilchuck	1,275	0	265	1,540
	83%	*0%*	*17%*	
Snoqualmie	1,892	143	8	2,042
	93%	*7%*	*0%*	
Overall	**3,455**	**215**	**840**	**4,295**
	80%	***5%***	***15%***	***100%***

Estimates of hatchery contribution of Chinook salmon to natural spawning populations in the Snohomish system, 1998.

	Spawning Escapement by Origin			
Subbasin	Natural Origin	Tulalip Hatch.	Other Hatch.	Total
Wallace River	210	15	1,320	1,545
	14%	*1%*	*85%*	
Skykomish/Pilchuck	1,285	72	1,512	2,869
	45%	*2%*	*53%*	
Snoqualmie	1,361	349	181	1,892
	72%	*18%*	*10%*	
Overall	**2,856**	**436**	**3,013**	**6,306**
	45%	***7%***	***48%***	***100%***

SOURCE: (Rawson et al. 2001)

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take</u>

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

See the WDFW HGMP for the Wallace River Hatchery for incidental effects of broodstock collection on listed populations.

Juvenile estuarine and nearshore residency of listed Puget Sound Chinook salmon may overlap with juveniles released by this program as previously described in Section 2.2.1.

- **Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish**.

See the WDFW Wallace River Hatchery HGMP for incidental effects of broodstock collection on listed populations.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See the WDFW HGMP for the Wallace River Hatchery for incidental effects of broodstock collection on listed populations.

The extent of possible adverse competitive effects of hatchery juveniles on listed populations of Puget Sound Chinook is not quantified at this time but is thought to be low and further reduced due to the near 90% reduction in the release level of fall Chinook described here and in Attachment 1.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

See the WDFW HGMP for Wallace River Hatchery for incidental effects of broodstock collection on listed populations and contingency plans.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

Not applicable. An ESU-wide hatchery plan for Puget Sound Chinook is currently being developed.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

The Puget Sound Salmon Management Plan (PSSMP 1985) sets out the legal framework under which co-management of hatchery programs occurs. Programs at the Bernie Kai-Kai Gobin Hatchery are included in the Stillagaumish/Snohomish Equilibrium Brood Document, which is currently in draft form only. Annual production levels are agreed to by the Co-managers and are described in the Future Brood Planning Document. Hatchery escapement goals and terminal area harvest management plans are described in the annual Stillaguamish/Snohomish regional status report (produced approximately on July 1st each year). The basic agreements between WDFW and the Tulalip Tribes concerning the operation of the Bernie Kai-Kai Gobin Hatchery were set up in a series of memorandums of understanding beginning on May 29, 1981. A revised memorandum of understanding between the Tulalip Tribes and the WDFW (August 26, 1997) described changes in the Chinook program that were agreed to at that time. Finally, a recent MOU (February 10, 2003) describes the criteria under which the change in source of broodstock from fall Chinook to the Skykomish summer stock will occur.

3.3) Relationship to harvest objectives.

The Co-managers are also following a harvest management plan for Puget Sound Chinook salmon. The National Marine Fisheries Service initially issued biological opinions for salmon fisheries within Puget Sound conducted between May 1, 2000, and April 30, 2003, concluding that these fisheries did not create jeopardy to listed Puget Sound Chinook salmon. Currently, the Co-managers recently submitted a plan for fisheries to be conducted between May 1, 2004, and April 30, 2009, for consideration by NOAAF. This *Co-managers' Puget Sound Chinook Harvest Management Plan* (February 21, 2003) lists harvest management objectives for each Puget Sound Chinook management unit. All operations of the Bernie Kai-Kai Gobin Hatchery are consistent with the above plans. Harvest of Chinook released by the Tulalip enhancement program will be conducted in terminal area 8D where hatchery fish have largely separated from other listed stocks as they return to their point of release in Tulalip Bay (Rawson, Kraemer, and Volk 2001). The Tulalip Tribes utilize time and area management and pulse fisheries to focus harvest on hatchery fish.

These methods will continue to be evaluated through sampling of the terminal area fishery for otoliths and coded-wire tags. A thermal mark has been placed on all Tulalip Chinook production, beginning with a unique mark for the fall stock in brood year 1993. A new, differential mark has been placed on all Skykomish Chinook hatchery stock released at the Bernie Kai-Kai Gobin Hatchery, beginning in brood year 1999. In addition, 100,000 fingerlings from each stock have received unique CWT's since comparative releases were initiated with the 1998 brood. We will continue to place differential, thermal marks on otoliths of 100% of these two stocks.

The contribution of hatchery fall Chinook production releases to the total Chinook harvest in Tulalip Bay has ranged from 90% to 96% in the most recent five years observed (1997 to 2001; Rawson, Kraemer, and Volk 2001 and the table below). Only limited information is currently available for Skykomish hatchery Chinook released by the Tulalip enhancement program, because the first release of mass thermally-marked Skykomish Chinook from the Bernie Kai-Kai Gobin Hatchery were initiated in 1999 (from brood year 1998). Since fall Chinook have been cultured and released longer than the native Skykomish stock, more complete data are available on their contribution to the terminal area fishery. Initial results from fall Chinook otolith marking and recovery are as follows:

Estimates of the contribution of Tulalip Hatchery Chinook to the Area 8D fishery based on recoveries of thermally-marked otoliths and coded-wire tags, 1997-2002.

Return Year	Hatchery Contribution
1997	91%
1998	93%
1999	96%
2000	90%
2001	94%
2002	94%

The above information has been incorporated into the Co-managers' Fishery Regulation Assessment Model (FRAM) so that incidental harvest of listed populations in Area 8D will be included with all other incidental harvest of listed populations (K. Rawson pers. comm.)

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

The only fisheries directed at Tulalip fall Chinook are conducted in terminal Area 8D during the time that adult hatchery fish return to Tulalip Bay (approximately mid-July through September each year). The Tulalip Tribes open a net fishery for Tribal members three days per week. The Washington Department of Fish and Wildlife (WDFW) opens a recreational hook and line fishery, also three days a week. Catch in the net fishery is recorded on fish tickets, and catch in the sport fishery is estimated by angler interviews and aerial surveys conducted by the WDFW. Catch estimates for the past twelve years are as follows:

Year	Area 8D Net	Area 8D Sport
1988	1,405	*
1989	2,438	*
1990	4,220	*
1991	4,001	*
1992	3,102	*
1993	3,714	*
1994	4,688	1,404
1995	8,013	2,279
1996	11,386	2,791
1997	8,376	2,902
1998	7,125	*
1999	15,368	511
2000	7,663	1,192
2001	6,062	1,708
2002	5,465	**

*No Tulalip special area fishery occurred in this year.
** Estimates not completed.

Harvest rates on Tulalip fall Chinook are managed to be as close to 100% as possible. There is no escapement requirement because the eggs for the program come from hatchery escapement surplus to production needs at WDFW facilities. Actual harvest rates on Tulalip fall Chinook have been in the range of 90% - 100% for the past 12 years. Future management of Tulalip fall Chinook will continue to focus on harvesting as close as possible to 100% of hatchery production while minimizing the impact of fisheries directed at hatchery-produced fish on listed populations. We will continue to thermally mass-mark this production and sample fisheries for otoliths to evaluate the success of our management at achieving these objectives.

Exploitation rates on listed populations are evaluated by the Co-managers based on total Chinook exploitation in all fisheries as described in the Co-managers' Puget Sound Chinook Management Plan. The contribution of incidental harvest of listed populations in the Area 8D fishery to overall exploitation rates is estimated with the FRAM model, which has been calibrated based on recent years' otolith samples and recoveries of coded-wire tags. In future years, we anticipate that overall exploitation rates on listed populations affected by the Area 8D fishery will be less than the Co-managers' guidelines. We will continually evaluate exploitation of these populations in the Area 8D fishery through ongoing collection of otolith and coded-wire tag data.

3.4) Relationship to habitat protection and recovery strategies.

Major factors affecting natural production and habitat management plans to facilitate Chinook salmon recovery are under development by work groups in the Stillaguamish and Snohomish watersheds. Initial recommendations for the Snohomish basin are described in the *Initial Snohomish River Basin Chinook Salmon Conservation /Recovery Technical Work Plan (October*

6, 1999). The Co-managers are also following a harvest management plan for Puget Sound Chinook salmon. The National Marine Fisheries Service initially issued biological opinions for salmon fisheries within Puget Sound conducted between May 1, 2000, and April 30, 2003, concluding that these fisheries did not create jeopardy to listed Puget Sound Chinook salmon. Currently, the Co-managers recently submitted a plan for fisheries to be conducted between May 1, 2004, and April 30, 2009, for consideration by NOAAF. This *Co-managers' Puget Sound Chinook Harvest Management Plan* (February 21, 2003) lists harvest management objectives for each Puget Sound Chinook management unit. All operations of the Bernie Kai-Kai Gobin Hatchery are consistent with the above plans.

3.5) Ecological interactions.

Predators, such as river otters, mergansers, cormorants, staghorn sculpin, cutthroat trout, and dolly varden trout, are sometimes seen consuming juvenile salmon released into Tulalip Bay. The ecological impacts of these fall Chinook salmon on other species in estuarine or marine waters are unknown.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Well water, and/or creek water is used at the Wallace River Hatchery for egg incubation to the eyed stage, then eggs are incubated on Tulalip Hatchery well water until they hatch and are ready to emerge and begin feeding. Upon ponding emergent fry, combined flows of the east and west forks of Tulalip Creek supply influent to small, outdoor raceways, and when Chinook fry reach a size of approximately 300 per pound (approximately 1.5 gram per fish), they are moved to larger raceways or an asphalt pond for additional rearing at the hatchery and then eventually they are transferred to the lower Tulalip Creek pond where they are released into Tulalip Bay at a size of approximately 75 fish per pound (~ six grams per fish).

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water withdrawal and screening do not affect listed natural fish, which are not present in Tulalip Creek. Effluent discharge, which passes through a natural biofilter after leaving the hatchery, is highly unlikely to affect listed natural fish that might be present in marine waters. The effect, if any, is not quantified.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The broodstock will be collected from a trap at the Wallace River Hatchery. The Wallace River

is located in WRIA 7, stream number 0942. The Wallace River Hatchery is located at river mile 4.0 of the Wallace River, and stream mile 0.0 of May Creek. Since no fall Chinook have been released from the Wallace River Hatchery since 1997 and all native summer stock are tagged and/or marked, the tagged and/or adipose-marked Chinook taken for broodstock for on-station and production releases at Tulalip indicate their native Skykomish River origin. In addition to their mark and tag status, general return and spawn timing at the Wallace River Hatchery will be used to determine which Chinook stock is being collected, with the native Skykomish River stock returning earlier than the fall stock. Fall Chinook will typically be collected from unmarked and untagged late spawners that return to the hatchery after September 1 each year. However, this is an approximate date that will shift somewhat from year to year, depending on run timing, which in turn is affected by marine and river harvest patterns, river flows, and other factors.

Fertilized fall Chinook eggs taken at the Wallace River Hatchery will be incubated in Heath incubators on May Creek surface water to the eyed stage. They will then be shocked, mortalities removed, and the healthy eyed eggs will be transported to the Tulalip Hatchery where they will be disinfected with a buffered iodophor solution and incubated on pathogen-free Tulalip Hatchery well water.

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Eyed eggs will be transported from the Wallace River Hatchery to the Tulalip Hatchery in washed, wet burlap sacks, well insulated from the wind and cold during transport.

5.3) Broodstock holding and spawning facilities.

Please see the WDFW HGMP for the Wallace River Hatchery.

5.4) Incubation facilities.

At the Wallace River and Tulalip hatcheries, fall Chinook will be incubated in Heath vertical stack incubators. At the Wallace River Hatchery, incubator stacks are sixteen trays high. At the Tulalip Hatchery, incubator stacks are eight trays high.

5.5) Rearing facilities.

Tulalip fall Chinook will be reared at the Tulalip Hatchery and lower Tulalip Creek pond. At the Tulalip Hatchery, juveniles will be reared to a weight of approximately 300 fish per pound in small outdoor raceways. They will then be transferred to larger outdoor raceways or to an asphalt pond for additional rearing at the hatchery. After coded-wire tagging 100,000 of the production in mid-April each year, the tagged juveniles will be transferred to the lower Tulalip Creek pond until their release at approximately 75 fish per pound.

5.6) Acclimation/release facilities.

Lower Tulalip Creek pond is used for natural rearing, acclimation, and release for this stock. It is an earthen pond, which provides a more natural environment for the fingerlings prior to their release. In the lower pond, fingerling Chinook develop natural feeding behavior and learn to avoid predators. This is an earthen pond created by a dam and a screened fish ladder on the downstream end. It is oval-shaped, and is approximately 49 meters wide (160 feet) by 37 meters long (120 feet; 1813 m^2). Its depth varies from the shore to approximately three meters deep in the center portion of the pond.

Fall Chinook will be combined in this pond along with the production summer Chinook that will also be acclimated in this pond prior to release. Thus, coded-wire tagged Chinook from both stocks for the comparative survival study will be subjected to identical rearing conditions prior to release, after they receive their unique tag codes.

Both the summer and fall Chinook will be reared in this pond until smoltification at a weight of approximately 75 fish per pound. This will occur in early- to mid-May each year. At this release size, summer and fall Chinook smolts will be released at high tide into Tulalip Bay.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

1. The handling of the broodstock, spawning, egg fertilization, transfer, and incubation, fish rearing, transfer, and release will be supervised by properly-trained hatchery technicians and managers, enhancement and harvest management biologists.

2. The stock will be reared at the Tulalip Hatchery, located on Tulalip Creek, which does not have any listed fish populations or other anadromous fish in it, so if any fish escape from the hatchery, they cannot mix with natural fish or any other salmonids in freshwater.

3. The incubation systems of the Wallace and Tulalip Hatcheries are equipped with low-water alarms and back-up water supplies.

4. Both hatcheries have well-trained staff on duty 24 hours per day, seven days a week.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

The Tulalip fall Chinook program has typically relied on Green River-origin fall Chinook. The priority for this program will be to collect adult Chinook that return to the Wallace River

Hatchery. However, fall Chinook have not been released from the Wallace River Hatchery since egg collections from fall Chinook were discontinued after brood year 1996. After making every effort to collect late-run adult Chinook returning to the Skykomish River, if fall Chinook eggs are no longer available at the Wallace River Hatchery to provide 200,000 eyed eggs for the experimental release and to supplement any shortfall in the summer Chinook egg take goal (1.6 million eyed eggs), they will be collected from fall Chinook stock held at other WDFW hatcheries.

6.2) Supporting information.

6.2.1) History.

In the past, summer and fall Chinook were generally differentiated at the Wallace River Hatchery based upon their return timing to the hatchery facility. This arbitrary delineation probably resulted in interbreeding among the summer and fall stocks. Thus, it is unlikely that the Wallace River Hatchery fall stock is descended solely from the Green River fall stock.

After the 1996 return, however, Chinook broodstock at the Wallace River Hatchery were only selected from fish that returned before September and spawned before October. Since no fall Chinook have been released from the Wallace River Hatchery since 1997 and all native summer stock are tagged and/or marked, the current broodstock collection criteria will be to collect unmarked late-run Chinook for the 200,000 experimental release under this program, and to collect only tagged and/or adipose-marked Chinook, indicating native stock origin, for the on-station and production releases at Tulalip. In addition to their mark and tag status, general return and spawn timing at the Wallace River Hatchery will be used to determine which Chinook stock will be spawned, with the expectation that native Skykomish River stock will generally return earlier than remnants of the introduced fall stock. Fall Chinook will typically be collected from unmarked and untagged late spawners that return to the hatchery after September 1st each year. However, this is an approximate date that will shift somewhat from year to year, depending on run timing, which in turn may be affected by marine and river harvest patterns, river flows, and/or other factors.

6.2.2) Annual size.

The annual egg take goal for this program will decrease from 1.7 million green eggs to 200,000 eyed fall Chinook eggs, for a release of approximately 200,000 fall fingerlings annually into Tulalip Bay.

Besides decreasing the fall Chinook egg take goal, this shift toward summer from fall Chinook production at the Tulalip facility will increase the required summer Chinook egg take at the Wallace River Hatchery. No fall Chinook will be released from the Wallace River facility. It is anticipated that current Skykomish summer Chinook fingerling release levels will be adequate to provide adult returns for use as broodstock at levels sufficient to meet the increased egg take goal. Therefore, the on-station release numbers at Wallace River Hatchery will remain at one million fingerling and 250,000 yearling Skykomish summer Chinook annually. The WDFW will manage for sufficient Skykomish Chinook adult returns to the Wallace River Hatchery traps to

meet the egg take goal for the combined on-station and Tulalip Chinook salmon fingerling enhancement programs.

Given the above on-station release goals and the new eyed egg transfer goal of 1.6 million eyed summer Chinook eggs to Tulalip, the Skykomish Chinook egg take goal at the Wallace River Hatchery will be 3.5 million green Skykomish River Chinook eggs and 200,000 late-run eyed Chinook eggs annually. The egg take from native Skykomish Chinook returns will be adjusted by the Co-managers if it is not sufficient to meet on-station release and eyed egg transfer goals.

In further recognition that there may be shortfalls of Skykomish River Chinook eggs on low return years to provide eggs for on-station releases and for the 1.6 million eyed egg transfer to the Tulalip Hatchery, this HGMP here reflects the contingency plan to collect additional later-timed Chinook returning to the Skykomish basin, beyond the experimental 200,000 eyed egg take, to supplement any shortfalls in the production egg take of native stock.

After making every effort to collect enough Skykomish Chinook eggs to meet on-station and transfer goals, if it is still not possible to collect enough eggs within the basin, a secondary contingency plan, developed by the Co-managers in the 2003 MOU Agreement, describes the intent to collect additional fall Chinook eggs from other WDFW facilities that maintain the Green River fall Chinook stock if necessary.

As previously mentioned, 200,000 eyed late-run Chinook eggs will be collected at the Wallace River Hatchery for coded-wire tagged experimental releases of up to 200,000 fall Chinook annually into Tulalip Bay, to compare relative pre- and post-release survival, comparative straying, and contribution to fisheries with a tagged portion of the earlier-timed Skykomish Chinook stock. These experimental releases will continue for at least four years (1993 to 1997), after which the parties will review and evaluate results from this study.

Every effort will be made to collect late-returning/late-spawning Chinook at the Wallace River Hatchery annually for the experimental releases. However, if it is not possible to collect enough late-timed Chinook from the Wallace River Hatchery or within the Snohomish basin, this HGMP again here describes the need for the contingency plan to provide additional fall Chinook eggs from other WDFW facilities that maintain the Green River fall Chinook stock, to achieve the 200,000 eyed eggs for the comparative survival study. All of these criteria are reflected in the WDFW-Tulalip 2003 hatchery Chinook MOU Agreement.

See the WDFW HGMP for the Wallace River Hatchery for more information regarding composition of the broodstock.

6.2.3) Past and proposed level of natural fish in broodstock.

See the WDFW HGMP for the Wallace River Hatchery.

6.2.4) Genetic or ecological differences.

Allozyme electrophoresis has shown that Green River fall Chinook are distinct from the native Snohomish and Stillaguamish Chinook stocks (Marshall et al. 1995).

6.2.5) Reasons for choosing.

The Green River fall Chinook stock performed well for the Tulalip Tribal enhancement program over the past 25 years during freshwater culture as well as after their release. This indicates that this stock was well-adapted to the lowland temperate water conditions at the hatchery during their freshwater residence, and to the rapid transition to the marine environment upon their release. Fall Chinook have been the mainstay production release stock for the Tulalip Tribes for many years, and their replacement requires the need to tag early- and late-run Chinook to compare their survival in the hatchery and after their release, as previously described in the justification and purpose portions of this HGMP (Sections 1.7 and 1.6).

It is not yet fully understood how well the Skykomish River summer stock, which originates from cooler waters of the upper-Snohomish River basin, will perform when it is reared in the lowland, temperate water conditions present at the Bernie Kai-Kai Gobin Hatchery and subsequently released directly into marine waters with no appreciable estuarine acclimation.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

See the Wallace River Hatchery HGMP for broodstocking protocols.

SECTION 7. BROODSTOCK COLLECTION

See the HGMP for the Wallace River Hatchery for all of Section 7.

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

7.2) Collection or sampling design.

7.3) Identity.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

7.6) Fish transportation and holding methods.

7.7) Describe fish health maintenance and sanitation procedures applied.

7.8) Disposition of carcasses.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

See the HGMP for the Wallace River Hatchery for all of Section 8.

8.1) Selection method.

8.2) Males.

8.3) Fertilization.

8.4) Cryopreserved gametes.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

SECTION 9. INCUBATION AND REARING

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Eyed eggs will be supplied by the Wallace River Hatchery for this program whenever possible. Please see the Wallace River Hatchery HGMP for broodstock survival and egg survival to the eyed stage. 200,000 eyed, late-run Chinook eggs will be transferred to the Tulalip Hatchery for incubation, hatching, and swim-up. Exact counts of eyed egg mortality or of swim-up fry numbers are not available, but survival has been high.

9.1.2) Cause for, and disposition of surplus egg takes.

See the Wallace River Hatchery HGMP.

9.1.3) Loading densities applied during incubation.

The loading density will be 6,000 eggs per Heath incubator tray.

9.1.4) Incubation conditions.

Fall Chinook eggs will normally be incubated on 47°F well water, except during rare extended power outages when east fork Tulalip Creek water will be used. In addition, water temperatures during eyed egg incubation will be modified according to a schedule using water chillers to apply thermal otolith marks. Both water sources will be at or near oxygen saturation upon entry to Heath stacks and will be above 90% saturation when the effluent leaves the incubator stacks.

9.1.5) Ponding.

Chinook fry will be ponded when they are at or near to full yolk absorption. Dates of ponding will vary according to the exact number of accumulated thermal temperature units (TU's) that the eggs have acquired during their incubation at the two facilities. Fry emergence will also vary slightly according to the thermal marking regime subjected to a particular egg lot, which will influence their accumulated TU's. Emerging fry will be ponded when they are judged to be at the button-up stage (near to full yolk absoption), and when ready to start feeding on salmon starter feed.

9.1.6) Fish health maintenance and monitoring.

Eyed eggs will be prophylactically treated in the Heath incubators with a 1,667 ppm formalin drip treatment for 15 minutes, three times per week, to control growth of opportunistic Saprolegnia sp. fungus.

Vexar matting will be used in the bottom of the Heath trays as substrate to afford alevins cover and reduce their need to swim to maintain them within the flowing water, which reduces abrasion of yolk sacs, conserves their energy, and increases early growth and fitness. All dead eggs will be removed at the Wallace River Hatchery after shocking and prior to transfer to Tulalip. No further dead egg removal is currently foreseen to be necessary from this stage until the fry hatch, emerge, and are ponded into small rearing raceways.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Not applicable.

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

The overall survival rate from green egg to smolt is approximately 80 percent.

9.2.2) Density and loading criteria (goals and actual levels).

Rearing densities are held under one half pound of fish per cubic foot of rearing area.

9.2.3) Fish rearing conditions

Proven, standard fish health and culture practices will be employed on each Chinook brood under hatchery culture. Rearing densities will be held as low as possible and will not exceed 0.5 lb/ft^3, water quality parameters, such as dissolved oxygen, will be monitored on a regular basis, and general aseptic hatchery management techniques will be employed to optimize fish health and survival.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Chinook growth data is currently being compiled but is not yet available.

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Data is currently being compiled but is not yet available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Feed Type / Size	Fish Size Fish Per Pound (fpp)
BioVita (BioOregon) / Size 0 mash	2700 – 530 fpp
BioVita (BioOregon) / Size 1 crumble	530 – 300 fpp
Nutra Plus (Scredding) / Size 2 crumble	300 – 197 fpp
Nutra Fry (Scredding) / 1.2-1.5 mm pellet	197 – 80 fpp

Juvenile Chinook will be fed a minimum of four times per day by hand. Feeding rates related to body weight and flow rates and estimates of feed conversion are currently being compiled but are not yet available.

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Each year, Northwest Indian Fisheries Commission (NWIFC) fish pathologists will screen a representative number of adults returning to Tribal hatcheries for infectious fish pathogens that may be vertically-transmitted from parents to progeny. The exact number of fish to be tested from each stock is specified in the Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State. The NWIFC pathologists work with hatchery crews to prevent or minimize pre-spawning mortality of broodfish to maximize egg fertilization and survival.

Preventative care is also promoted through routine juvenile fish health monitoring. Pathologists conduct fish health exams at each of the Tribal hatcheries on a monthly basis from emergence until release. Monthly monitoring exams include an evaluation of rearing conditions as well as sampling small numbers of juvenile fish to assess their health status. Diagnoses are reported to the Hatchery Manager and Enhancement Biologist along with any recommendations for improving or maintaining fish health, and preventing or controlling disease. Vaccines are administered as required to prevent the onset of two bacterial diseases at this hatchery (vibriosis and enteric redmouth disease). Pathologists will work with the Enhancement Biologist, Hatchery Managers, and Technicians to ensure that drugs and chemicals are dispensed properly during treatments. The entire health history for each hatchery stock is maintained in a relational database called AquaDoc.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Not available.

9.2.8) Indicate the use of "natural" rearing methods as applied in the program.

All juvenile Chinook fingerlings will be transferred to the lower Tulalip Creek pond, where they will be held under natural rearing conditions for a minimum of 30 days prior to release into Tulalip Bay. The characteristics of this pond closely mimic natural rearing conditions, including overhead cover, earthen substrate, natural feed supplementation, in-column structure, natural inflow, natural camouflage coloration/pond coloration, and presence of natural predators. Program fish develop natural morphology and behavior, including more natural body coloration, predator avoidance and natural feeding behaviors, by adapting to these natural environmental conditions, which minimizes the influence of the artificial culture environment and is thought to increase their post-release survival.

9.2.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Proper mating strategies and natural rearing of juvenile Chinook for a relatively short period (several months to the fingerling stage) minimizes the potential for adverse genetic and ecological effects that may result from the artificial rearing environment.

SECTION 10. RELEASE Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Age Class	Number	Size (fpp)	Release Date	Location
Fingerling	200 thousand	70-80 fish/lb.	May 5-15	Tulalip Bay

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Tulalip Bay
Release point: Tulalip Creek lower pond
Major watershed: WRIA 7 (Snohomish)
Basin or Region: Puget Sound

10.3) Actual numbers and sizes of fish released by age class through the program.

Tulalip Hatchery fingerling fall Chinook salmon fingerling releases and marking, and tagging rates (1994 to 2003).

Brood Year	Release Year	AD/CWT	AD Only	CWT Only	Unmarked and Untagged	TOTAL RELEASED	Percent Ad Clipped	Percent CWT	Percent Marked [1]
1993	1994	0	0	0	1,280,000	1,280,000	0.0%	0.0	100%
1994	1995	0	0	0	1,265,000	1,265,000	0.0%	0.0	100%
1995	1996	0	0	0	1,860,000	1,860,000	0.0%	0.0	100%
1996	1997	0	0	0	1,900,000	1,900,000	0.0%	0.0	100%
1997	1998	0	0	0	1,700,000	1,700,000	0.0%	0.0	100%
1998	1999	67,035	14,318	0	1,608,647	1,690,000	4.8%	0.0	100%
1999	2000	101,107	11,610	0	1,827,283	1,940,000	5.8%	0.1	100%
2000	2001	87,134	17,825	1,193	1,118,848	1,225,000	8.6%	0.1	100%
2001	2002	88,956	5,440	877	1,051,478	1,146,751	8.2%	0.1	100%
2002	2003	74,623	17,808	3,005	1,155,122	1,250,558	7.4%	0.1	100%
		Averages for all years:				**1,525,731**	**3.5%**	**3.0%**	**100.0%**
		Release Years '01 - '03 Averages:				**1,207,436**	**8.1%**	**7.1%**	**100.0%**
		Release Years '94 - '00 Averages:				**1,662,143**	**1.5%**	**1.3%**	**100.0%**

10.4) Actual dates of release and description of release protocols.

Date of Release	Number Released	Size at Release	Type of Release
5/14/02	1,146,751	80	Forced
5/8/01	1,225,000	80	Forced
5/10/00	1,940,000	80	Forced
5/24/99	1,690,000	78	Forced
4/30/90	1,700,000	80	Forced
5/12/97	1,900,000	83	Forced
4/29/96	1,860,000	77	Forced
5/19/95	1,265,000	75	Forced
5/11/94	1,280,000	80	Forced
5/20/93	1,490,000	91	Forced
5/5/92	1,188,000	92	Forced
5/15/91	1,390,000	82	Forced
5/11/90	1,900,000	90	Forced
5/19/89	625,000	85	Forced
5/9/88	1,400,000	90	Forced
5/19/87	1,043,000	89	Forced

See also: http://www.nwifc.wa.gov/CRAS .

10.5) Fish transportation procedures, if applicable.

Not applicable. All releases were/will be on-station.

10.6) Acclimation procedures.

A valve from lower Tulalip Creek to Tulalip Bay will be opened during incoming higher high tide. This will allow for several hours of mixing of marine and fresh water prior to Chinook moving from lower Tulalip Creek pond to Tulalip Bay at lower low tide.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

All fall Chinook released from the Bernie Kai-Kai Gobin Hatchery have been mass-(otolith)-marked since the 1993 brood. All fall Chinook that were/will be coded-wire tagged (100,000 per year) at the Tulalip Hatchery will also be adipose fin-clipped.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Not applicable.

10.9) Fish health certification procedures applied pre-release.

Monthly fish health monitoring exams, as described in section 9.2.7, will be conducted by a fish pathologist from the NWIFC up until the time of release. In addition, fish will typically be examined within two weeks of their scheduled release. The exams will include assessments of mortality rates, fish behavior, general health, and rearing conditions. A necropsy will be performed on representative Chinook from the population, including moribund and dead fish if these are available. An attempt will be made to determine factors contributing to mortality. Parasites will be routinely screened for by microscopic examination of gills and skin. Bacterial or viral assays may be conducted at the discretion of the pathologist if there is evidence of an infectious disease problem. Depending upon the findings of the exam, a recommendation will be made to either release the fish as planned if they are healthy, or if disease or infectious fish pathogens are present, treatments will be applied as necessary to regain fish health prior to release.

10.10) Emergency release procedures in response to flooding or water system failure.

In the event of flooding or water system failure, hatchery personnel have the ability to switch from either well water or west fork Tulalip Creek water or east fork Tulalip Creek water. During hatchery rearing, it is always possible to modify the hatchery water source to protect Chinook stocks under culture. Flooding is not an issue at the hatchery or in Tulalip Creek pond.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

This is an isolated facility. No anadromous fish inhabit Tulalip Creek. Imprinted fish are released directly into marine waters.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

Note: Annual accomplishment of monitoring and evaluation of performance indicators is contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects have been accomplished primarily through acquiring Hatchery Reform and self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Performance Indicator (Section 1.10)	**Monitoring Plan Objective** (Section 11)	**Methods/Comments** (Section 11)
On average the estimated survival rate for the hatchery production will remain above 0.005 to provide: • for the recruitment of 10,000 December Age 3 fish of, and • an average terminal harvest rate of > 0.95	Overall fall Tulalip Chinook survival rate estimates are available from reconstructed CWT recoveries for Tulalip Chinook in brood years 1986-1991.	▪ We will review the recoveries and analyze them to determine adult equivalent survival rates for the 6 brood years. We will develop a model to relate terminal area return by age to overall survival by assuming that preterminal interception rates equal those for nearby indicator stocks. ▪ Stock and age composition for the terminal area fishery will be determined from weekly sampling of the fishery for scales, CWT's, and otoliths.
Annual fisheries plans project exploitation rates below the Co-managers' guidelines for all Puget Sound Chinook management units.	FRAM or successor model will be used to make annual projections of impacts	Model inputs for impact of Area 8D fishery will be updated annually based upon results of otolith sampling and analyses (see below for otolith sampling requirements).

Performance Indicator (Section 1.10)	**Monitoring Plan Objective** (Section 11)	**Methods/Comments** (Section 11)
Post-season assessments of exploitation rates on natural-origin, listed Stillaguamish and Snohomish Chinook will be below Co-managers' guidelines.	Post-season analysis of coded-wire tags (from indicator stocks), combined with analysis of otoliths collected from Area 8D (from the Tulalip hatchery stock) will be conducted.	▪ All fisheries must be sampled for coded wire tags at appropriate rates (at least 20% sample for net fisheries, and at least a 10% rate for other fisheries). ▪ Otoliths must be collected from at least 100 Chinook salmon per week in the Area 8D fishery for analysis in the laboratory.
The proportion of Tulalip origin spawners in the natural spawning areas remains below Co-managers' guidelines.	Estimate the annual contribution of Tulalip hatchery Chinook to natural populations such that the upper bound of the 90% confidence interval is 10% contribution when the true contribution rate is 5%.	▪ Mass-mark all Chinook production with otolith marks. ▪ Collect otoliths from at least 100 Chinook carcasses per population per year in the Snohomish and Stillaguamish watersheds for mark detection. ▪ See Section 12 below for further information.
Evaluate the level of interaction of hatchery fall Chinook Tulalip Bay releases with out-migrating natural-origin smolts. Test the hypothesis that the time of peak abundance of Tulalip Fall salmon and naturally-produced salmon in local marine waters do not differ significantly.	Estimate the abundance and the temporal and spatial distribution of natural salmon populations that may be present in Tulalip Bay. Estimate the timing of the natural Chinook smolt out-migration from local rivers.	This requires a new research project to establish the optimum time/area strata for release that would minimize impacts on natural populations. Information from new in-river smolt trapping projects in the Stillaguamish and Snohomish systems will be part of this research.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Please see the preceding Section 11 for M&E projects that are also research projects. In addition, hatchery Chinook otolith marking and recovery M&E and research projects are being conducted, provided funding continues to be available for this, in order to distinguish juvenile and adult hatchery and natural stock components. This has enabled evaluations of stray rates, hatchery and natural escapement estimates (Rawson, Kraemer, and Volk 2001), and ongoing studies of ecological interactions between program Chinook releases and ESA-listed Chinook juveniles. This 100% marking, contingent on funding availability, is an essential complement to ongoing juvenile salmonid monitoring and research efforts in the river, estuary, and nearshore marine areas. It would not be possible to identify the origins of Tulalip Hatchery Chinook without this otolith marking, and proposed mass adipose fin marking will not accomplish this essential identification as to hatchery of origin that is necessary to monitor the production from this program. The tribes and State have active Chinook coded-wire tagging, and adipose fin clipping programs currently in place, which has also been funded through Hatchery Reform.

With adequate funding, the adult Chinook recovery program can continue to be implemented in the Snohomish basin to allow for enumeration of hatchery and natural stock components in the Snohomish Chinook escapement and for evaluations of straying. Annual accomplishment of research projects listed throughout this HGMP is contingent on availability of funding. As of 2004, most research, monitoring, and evaluation projects needed for this program have been accomplished primarily through acquiring Hatchery Reform and BIA self-governance funds specifically dedicated for hatchery reform and rehabilitation.

Project 1. The purpose of the otolith marking and recovery project is to estimate the rate of contribution of natural- and hatchery-origin Tulalip hatchery summer and fall Chinook to the terminal area fishery and to natural and hatchery spawning populations of Chinook salmon in the Snohomish system (Rawson et al. 2001).

Project 2) Juvenile smolt trapping in the Skykomish and Snoqualmie Rivers. Purpose is to annually document demographic, ecological, and biological data (estimate relative abundances, total smolt yields, migration timing, relative size (fork lengths, whole body weights, condition factors), ecological interactions of Chinook and other juvenile salmonids out-migrating from the Snohomish system.

Project 3) Juvenile salmonid utilization of the Snohomish River estuary. The initial purposes of this study were to determine if use of Snohomish River estuarine habitats by juvenile Chinook salmon is correlated to life history type of the fish and attributes of the estuarine habitats. Habitat use is defined by measuring growth rates, diet, distribution, abundance, and habitats used. Life history patterns are indicated by both timing and fish size at estuarine entry, and by origin. Attributes of estuarine habitats include the geographic position of habitat in the estuary, salinity, depth, and velocity. We will obtain information on origin (Snoqualmie vs. Skykomish), timing and size of migration, and estuarine habitat utilized, as well as, a collection of scales and otoliths for comparison with future samples of scales and otoliths from adult returns.

These studies are helping us to better understand and evaluate the level of interaction of hatchery-origin summer Chinook smolts released into Tulalip Bay with natural-origin, juvenile Chinook in estuarine and nearshore habitats.

Information is being gathered on relative out-migration timing, spatial overlap, and relative abundances of Tulalip summer Chinook salmon and naturally-produced Chinook salmon in the Snohomish estuary and nearshore marine areas including Tulalip Bay, which will help to assess the potential for adverse ecological interactions among natural-origin and program Chinook juveniles such as competition or predation, upon release.

Project 4) Contribution of hatchery- and natural-origin Chinook salmon to natural and hatchery spawning areas, ocean and freshwater fisheries, and escapement estimation for the Snohomish basin using coded-wire tagging, fin clipping, and recoveries in fisheries and on spawning grounds.

12.2) Cooperating and funding agencies.

Please see Section 12.1 also regarding the relationship of funding to proposed research, monitoring, and evaluation programs in this HGMP. The Tulalip Tribes provide funding for all projects in this HGMP (adult otolith marking, freshwater smolt trapping, estuarine and nearshore marine trapping and seining, ecological interactions, adipose fin marking, coded-wire tagging, adult Chinook recovery programs in the Tribal fishery and throughout the Snohomish basin), NOAA fisheries also provide funding for estuarine and nearshore trapping and seining, ecological interactions, and WDFW cooperates in the otolith marking and recovery project, smolt trapping, ecological interactions, adipose fin marking, coded-wire tagging, and adult Chinook recovery programs in the Snohomish basin.

Since project 1 began in 1998, funds have been provided through Pacific Salmon Treaty implementation, Hatchery Reform funding through the NWIFC, and a fishery research grant from NOAA. Some funds from the Tulalip Tribes fishery management contract with the BIA have also supported this project. The WDFW has provided brood stock collection and egg incubation, much of the sample collection effort, and has cooperated in all phases of data analysis and interpretation. The Snohomish Public Utility District has also assisted in collecting otolith samples. NOAA Fisheries and the Tulalip Tribes have funded estuarine and nearshore marine sampling research, BIA Jobs in the Woods funding has supported Tulalip smolt trapping efforts.

12.3) Principal investigator or project supervisor and staff.

Project 1) Otolith marking and monitoring the contribution of hatchery- and natural-origin coho salmon to natural and hatchery spawning areas and escapement estimation for the Snohomish basin using thermal mass-marking of otoliths (proposed new study): Principal Investigator: Kit Rawson, Senior Fishery Management Biologist.
Project Supervisors: Mike Crewson, Kit Rawson (Tulalip Natural Resources / Fisheries Department), Robert Skoog, Richard Young, and technician crew (Tulalip Environmental /

Natural Resources Department), and Curt Kraemer and Eric Volk (WDFW).

Project 2) Smolt trapping operations: Kurt Nelson, Brian Kelder, Kit Rawson, Mike Crewson, and technician crew; Tulalip Environmental / Natural Resources Department.

Project 3) Estuarine and nearshore marine environment habitat utilization and species composition studies: Mindy Rowse and Kurt Fresh (NOAA Fisheries), Brian Kelder, Kurt Nelson, Todd Zackey, Mike Crewson, Kit Rawson (Tulalip Environmental / Natural Resources Department).

Project 4) Coded-wire tagging, fin marking, and mark/tag recoveries in fisheries and on hatchery and on natural spawning areas (estimate directed and non-landed fishery mortality, conduct and evaluate DIT and preserve integrity of the coded-wire tagging system, evaluate mark-selective fisheries and impacts on ESA-listed salmon stocks and other natural-origin salmonids, measure run timing, survival rates, migration patterns, and stray rates into other watersheds: Kit Rawson, Marla Maxwell, Mike Crewson, and technician crew (Tulalip Natural Resources/Fisheries Department), Curt Kraemer Doug Hatfield, and Darin Combs, and technician crew (WDFW).

12.3) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

Non-listed hatchery stock.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

For Project 1, otoliths of developing embryos will be thermally marked after their eye pigment becomes visible in the eggs while they are held in hatchery incubators, by applying regular patterns of temperature variation in the water. Otoliths will be identifiable as to hatchery of origin and brood year. Otoliths will be extracted from adult fish taken in the terminal area fishery, from carcasses on the spawning grounds, and from hatchery escapement populations. No live fish will be sampled for otoliths. Otoliths will be stored in 95% ethanol and later shipped to the WDFW Otolith Laboratory, where unique marks will be identified using a compound microscope.

Publications, annual reports, draft summary reports, Biological Assessments and Opinions are available with these details for the other projects.

12.6) Dates or time period in which research activity occurs.

Otolith marking will occur during incubation in the hatchery prior to hatching each winter (approximately November-January annually). Fishery sampling will occur from July through September annually. Spawning population sampling will occur from September-October each year. Sampling plans for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

Live eyed Chinook eggs will be thermally-marked according to standard methods developed by the WDFW Otolith Laboratory. Thermal marking patterns on otoliths will be made by temporally controlling periods of incubation water temperature change ($\Delta \approx 3.5$ °C), alternated by periods of normal water temperature. Care and maintenance of live fish, eggs, holding durations, transport methods, and other details for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.8) Expected type and effects of take and potential for injury or mortality.

Expected take of listed fish will be minimal to zero by using marked and/or tagged hatchery fish for broodstock. Fishery and hatchery rack sampling involves zero take of listed populations. Spawning ground sampling will be conducted either from rafts, which have zero mortality, or by foot surveys, which may involve very minimal mortality due to possible disturbance of Chinook redds. Samplers are aware of the location of natural Chinook redds and make every effort to avoid these during sampling of carcasses. Overall mortality to listed populations will be negligible from this project. Expected type and effects of take and potential for injury or mortality for the other studies were previously described and included in the aforementioned reports and assessment documents.

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

Negligible, please see above.

12.10) Alternative methods to achieve project objectives.

Not applicable. Conducting no M&E and research actions was the previous alternative, which was rejected and replaced with the Hatchery Reform monitoring projects described above.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

Negligible mortality will occur to any species due to these research projects. Negligible mortality of other juvenile salmonids is thoroughly documented in the smolt trapping and estuarine trapping and seining projects.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Samplers conducting foot surveys on the spawning grounds are trained to recognize and avoid

natural redds and live fish. Risk aversion measures to minimize adverse effects to listed fish as a result of the proposed research activities were previously described above or in the aforementioned reports and were specified in the assessment documents.

SECTION 13. ATTACHMENTS AND CITATIONS

Marshall, A. R., C. Smith, R. Brix, W. Dammers, J. Hymer, and L. LaVoy. 1995. Genetic diversity units and major ancestral lineages for Chinook salmon in Washington. Washington Department of Fish and Wildlife Technical Report RAD 95-02.

Puget Sound Salmon Management Plan. 1985. United States vs. Washington 1606 F. Supp. 1405.

Rawson, K. 2000. Stillaguamish Summer Chinook: Productivity Estimates from Coded-Wire Tag Recoveries and A Simple Model for Setting Interim Exploitation Rate Objectives. Tulalip Fisheries, 7515 Totem Beach Rd., Tulalip, WA. 98271.

Rawson, K., C. Kraemer, and E. Volk. 2001. Estimating the abundance and distribution of locally hatchery-produced Chinook salmon throughout a large river system using thermal mass-marking of otoliths. North Pacific Anadromous Fisheries Commission Technical Report 3:31-34.

Snohomish Basin Salmonid Recovery Technical Committee. 1999. Initial Snohomish River Basin Chinook Salmon Conservation/Recovery Technical Work Plan. Snohomish County Surface Water Management, 2731 Wetmore Ave. Ste. 300, Everett, WA. 98201-3581.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 2003. Memorandum of Understanding. Tulalip Indian Tribes, 7515 Totem Beach Rd., Tulalip, WA. 98271.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 1997. Memorandum of Understanding. Tulalip Indian Tribes, 7515 Totem Beach Rd., Tulalip, WA. 98271.

Tulalip Indian Tribes and Washington Department of Fish and Wildlife. 1981. An Agreement Between the Tulalip Tribes and the Washington Department of Fisheries Concerning the Tulalip Tribes Salmon Hatchery. Tulalip Indian Tribes, 7515 Totem Beach Rd., Tulalip, WA. 98271.

Washington Department of Fisheries, the Stillaguamish Tribe, and the Tulalip Indian Tribes. 1992. Draft Stillaguamish/Snohomish Equilibrium Brood Document. Tulalip Indian Tribes, 7515 Totem Beach Rd., Tulalip, WA. 98271.